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Impacts of Intellectual Property Rights on Trade Flows in ASEAN countries*

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This study provides new evidence regarding the linkage between the enforcement of IPR and trade flows in ASEAN countries. Based on the analysis of a gravity model and using the categorized panel data, the study finds robust empirical results. First, reinforced IPR protection in the importing countries (non-ASEAN countries) has a positive impact on ASEAN's exports, indicating the prevalence of the market expansion effect. Stronger effects are found in the high-tech sectors such as chemicals, machinery and transport equipment. Second, increased IPR protection in the importing countries (ASEAN) has a negative effect on ASEAN's imports, exhibiting the dominance of the market power effect. Stronger effects are found in the manufactured goods, beverage and tobacco industries. Third, since the coefficient on the IPR index is positive and statistically insignificant, we conclude that stronger protection of IPRs in both the ROW and ASEAN leads to an ambiguous increase in bilateral trade between ASEAN and the ROW. This is because of the fact that the increase in ASEAN's exports due to stronger IPR protection in the ROW is partly cancelled out by the decrease in ASEAN's imports as the result of stronger IPR protection in ASEAN.

Keywords: ASEAN, Gravity Model, Market Expansion Effect, Market Power Effect

1. INTRODUCTION

Economists have recognized that the protection of Intellectual Property Rights (IPR) has a significant impact on trade flows. The preliminary conjecture is that weak IPR protection distorts natural trade patterns and the ability of firms to transfer technology abroad. Thus, differences in national norms regarding IPR protection are thought to negatively affect freer flows of international trade. This could be one of the reasons why the regulation of national regimes of intellectual property rights has recently become a contentious issue. Indeed, disputes over IPR during the 1980s led to numerous initiatives to harmonize and strengthen IPRs at national and international levels. The resulting Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of 1994 represents the most far-reaching multilateral agreement toward global harmonization of IPR.

The results of the Uruguay Round were, however, extremely controversial for many WTO member countries.[1] From the developed countries' point of view, lack of IPR protection in developing countries constitutes an unfavorable trade environment that could reduce their firms' competitive positions. Thus, they called for multilateral rules and enforcement of IPR. On the other hand, many developing countries strongly opposed this,

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[1] As explained in Hoekman and Kostecki (2001: 274-299), an intellectual property system seeks to create a balance between the need for a temporary monopoly to create incentives for innovation and the benefits of free access knowledge.

arguing that non-protection of IPRs on their part had a negligible impact on producers in OECD countries, and that adoption of stronger IPRs would increase the profitability of foreign firms at the expense of domestic producers and thus would be detrimental to their welfare and development prospects (Hoekman & Kostecki 2001: 274-299).

Theoretically, economic analysis is unable to predict the direction of the impacts of IPR protection on bilateral trade flows.[1] The existence of this ambiguity is due to the fact that, in a market initially served by foreign and infringement products,[2] the strengthening of IPRs would create two effects working in opposite directions (see, e.g., Schwartz 1991: 231-246; Taylor, 1993: 625-638; Taylor, 1994:361, 382, 638; Maskus & Penubarti 1995: 227-248; Smith, 1999: 151-177). On the one hand, the protection of IPRs in the importing country grants monopoly power to the exporting country. So the imports may decrease if exporters exercise their enhanced market power by reducing output and charging higher prices to segments of their foreign markets. On the other hand, greater protection of IPRs in the importing country might expand imports because stronger IPR protection deters local imitation and increases the net demand for the protected products. Since these two effects are offsetting, no clear prediction can be made regarding the direction of the impact of IPR protection on trade.

This theoretical ambiguity regarding the impact of IPR protection on international trade has, nonetheless, led to several empirical attempts. Recently, a growing body of literature on the nature and direction of the effects of IPR protection on international trade flows suggested that the relationship between IPRs and trade cannot be generalized (see Maskus & Penubarti 1995: 227-248; Frink & Primo-Braga, 2005; Jung 2007: 231-258; Kang and Park 2006: 5-31; Smith 1999: 151-177; Rafiquzzaman 2002: 307-330; Smith 2002: 495-512; Oh and Won 2005: 19-42). However, the remaining theoretical ambiguity coupled with mixed empirical results regarding the impact of IPR protection on trade flows suggest that the impact of stronger IPR on international trade is an empirical issue. This has induced us to concentrate on the empirical analysis of the issue on the ASEAN case. The objective of this research is to analyze the impact of IPR protection on trade flows in ASEAN countries. It is guided by the following research questions:

- Does stronger protection of IPRs affect ASEAN's exports and imports?
- How does IPR protection affect the trade flows of individual industries differently?
- Which policy implications can be derived from the study?

The empirical analysis in this paper differs from the previous studies in several respects. First, this study provides new evidence regarding the linkage between IPRs and trade with a focus

[1] Maskus (2000: 113) noted that theoretical models do not clearly predict the impacts of variable patent rights on trade volumes. Much depends on local market demand, the efficiency of imitative production, and the structure of trade barriers. Also important are the reactions of imperfectly competitive firms. Thus, a clear picture can emerge only from empirical studies.

[2] Once the product has been imitated, unauthorized copies of this product do not necessarily need to exhaust the entire domestic market immediately because imitators might face several limitations (such as financial constraints, lack of labor force, poor distributional networks, etc.). Additionally, even in a weak IPR system, the enforcement levels might be able to deter piracy in some segments of the market. Accordingly, it makes sense to conceive an initial equilibrium with a foreign firm and domestic competitive fringe.

on ASEAN countries. Little evidence has ever been documented on the experiences of ASEAN countries and in that sense, this study would provide important insights into ASEAN countries where level of economic development and imitation capacity differs across the members. Second, the study is based on the analysis of more recent panel data which allow the patent regime to change over time. Third, the impact of IPR is firstly forced to be uniform across sectors and then is allowed to differ across sectors so that industry-specific evidences can be documented. Finally, to measure the status of an IPR regime, the IPR index developed by Park and Ginarte (1997: 283-301) is used.[1]

2. THEORETICAL FRAMEWORK

Although it is unambiguous that IPR protection can influence trade flows, the net impact on trade flows from strengthening the protection of IPRs remains theoretically ambiguous (Maskus, 2000; Maskus & Penubarti 1995: 227-248). Stronger protection of IPRs in importing countries allows the foreign exporters to behave more monopolistically and to choose to serve the exporting market by foreign direct investment or by licensing its intellectual asset to a foreign firm (Ferrantino 1993: 300-331; Lee & Mansfield 1996: 181-186; Maskus 1998: 186-208; Seyoum 1996: 50-59), which is known as the *market power effect*. Simultaneously, a stronger level of IPR protection in importing countries encourages the foreign exporters to export more to the foreign market due to the shrinkage of imitative activities in importing countries, which is known as the *market expansion effect*.

The link between IPRs and trade can not be answered by theoretical argument alone. Empirically, a number of studies have attempted to estimate the effects of IPR protection (e.g., Al-Mawali 2005: 823-828; Wen-Hsien & Ya-Chi 2005: 1543-1555). Kang and Park (2006: 5-31) used gravity model to analyze the impacts of foreign IPRs level on the export of Korea from 2001 to 2003 divided by trading partners and industries. They found that foreign IPRs level has negative effects on Korea's total exports. However, the effects of IPRs are found to be negative in the export to developing countries and low-tech industries exports, but positive in the high-tech industries export to developed countries. Using 1984 data, Maskus and Penubarti (1995: 227-248) found that a stronger protection of IPRs increases trade flows — that is the market expansion effect tends to dominate the market power effect — when all industries are pooled. Jung (2007: 231-258) also found that foreign protection of IPRs have the market expansion effects on total IT exports of Korea. This result is confirmed by Oh and Won (2005: 19-42), who found similar results — that is, Korea tends to export more to the trading partners where their patents are highly protected. Primo-Braga and Frink (1997) used a similar model and produced the same results.[2] Ferrantino (1993: 300-331) studied the effect of IPR regimes on exports. Using the US export data, he found that importing countries' patent regimes do not affect total exports. Smith (1999: 151-177) qualified these results by showing that the market expansion effect of IPRs depends on whether local firms are capable of imitating the exporter's technology. The study indicated that US exports are sensitive to patent rights in importing countries, and the direction of the

[1] Rapp and Rozek (1990: 75-102) also developed the IPR index. However, the IPR index developed by Park and Ginarte is the most appropriate in the present context because it has the broadest country coverage. Moreover, it allows for a much more fine-tuned ranking of national IPR system.

[2] They found that there was a positive link between patent protection and trade flows.

relationship rests with the threat of imitation.[1] Rafiquzzaman (2002: 307-330) found that the effect of stronger patent rights is seen to increase exports to those countries that pose a strong threat of imitation and to reduce exports to countries that pose weakest threat of imitation. This result is also confirmed by Smith (2002: 495-512), who showed that stronger foreign patent rights stimulate the market expansion of US drug exports across countries with strong imitative abilities, but enhance the marker power of US drug exporters across countries with weak imitative abilities. More recently, Frink and Primo-Braga (2005: 19-40) found a positive link between IPRs and trade flows for total non-fuel trade, but a weak link between IPRs and high technology trade.[2]

A review of the previous literature on the subject leads to the following conclusion. Theoretically, there is a link between IPRs and trade flow — more specifically, IPRs do affect trade. However, the direction of the impact is ambiguous, depending on the interaction between market expansion and market power effects. Empirically, evidence on the linkage was mixed, suggesting that the impact of IPR protection on trade flows can only be assessed on a case-by-case basis. However, past empirical evidence showed that industrial countries with relatively weak IPR regimes tended to experience an increase in bilateral trade (bilateral imports).[3] In contrast, in underdeveloped and developing countries with weak patent rights and weak imitation capacities, the market power effect tended to dominate.[4]

3. METHODOLOGY

3.1. Analytical model

The topic being explored is most suited to a quantitative approach. In seeking to empirically estimate the impacts of increased IPR protection on international trade flows, a gravity model is adopted. The gravity model is commonly applied in the international trade literature to analyze trade distortions associated with policy differences across countries. The specification takes various forms that include both exporter and importer characteristics and other trade resistance or inducement variables. Our regression equation is as follows[5];

$$\ln T_{ijt} = \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_5 \ln DIST_{ij} + \beta_6 BORD_{ij} + \beta_7 EX\text{-}COLONY_{ij} + \beta_8 LANG_{ij} + \beta_9 IPR_j + e_{ij}$$

[1] The threat of imitation may be viewed as a reflection of an importing country's ability to imitate technologies embodied in the imported goods.

[2] The authors' possible explanations are that the market power effect of IPRs could very well dominate in high-technology sectors, that stronger IPRs lead to a switch from exporting to FDI, or that technology exports depend on alternative means of appropriation (such as first-mover advantages or reputation).

[3] Industrial countries have strong imitation abilities. So to a large extent, their markets might be served by imitated goods. Stronger IPR regimes would reduce the level of local infringement, and imitated goods are replaced by foreign patented goods, generating a market expansion effect.

[4] Initially, markets of these countries might already be served by foreign exporting firms. Since the imitation abilities in these countries are often weak, the strengthening of IPR regime in these countries would not create the market expansion effect large enough to outweigh the market power effect.

[5] We adopt Glick and Rose (2002: 1125-1151) for the empirical specifications.

- T_{ijt} is bilateral trade volume between country *i* and country *j* at the time t.
- GDP_{it} and GDP_{jt} are the gross domestic products (GDP) of the country *i* and country *j* at the time t respectively.
- POP_{it} and POP_{jt} are populations of country *i* and country *j* at the time t respectively.
- $DIST_{ij}$ is geographical distance, measured as the crow flies, between the capital cities of country *i* and the capital city of country *j*.
- $BORD_{ij}$ is a dummy variable that equals 1 if both country *i* and country *j* have a common border, and zero otherwise.
- $LANG_{ij}$ is a dummy variable that equals 1 if both country *i* and country *j* speak the same language, and zero otherwise.
- EX-COLONY is a dummy variable that equals 1 if country *i* was ever colonized by country *j* or vice versa, and zero otherwise.
- IPR_j is the IPR index of the importing country
- e_{ij} is an error term.

The gravity theory predicts that parameters on GPD are positive (Anderson 1979: 106-116). The coefficients on populations could be positive or negative depending on whether the *economies of scale effect* or the *absorption effect* is dominant (Brada & Mendez 1983: 589-603; Endoh 1999: 207-216; Endoh 2000: 571-589; Linnemann, 1966; Oguledo & Macphee 1994: 107-120). Distance between trading partners is used as a proxy for several distance-related variables such transport costs, cultural differences, and access to relevant market information. Therefore, I expect that the sign of this variable is negative. Since a commonly shared border, linguistic affinity and ex-colony status tend to reduce overall cultural distance and encourage bilateral trade, it is expected that the coefficients for these three dummy variables are positive.

In line with the existing literature, IPR has an indeterminate effect on bilateral trade, and thus the impact of IPRs is an empirical issue. Therefore, the sign of the coefficient of the IPR index could be positive (reflecting the dominance of market expansion effect) or negative (reflecting the dominance of market power effect).

3.2. Model Specification

First, the regression equation with respect to total bilateral *trade* between ASEAN and the Rest of the World (ROW) is estimated. This means that, by pooling the panel data on exports and imports together, we force the impact of IPRs on ASEAN's exports and imports to be uniform. Second, the regression model with respect to ASEAN's *exports* to ROW (classified by ASEAN's total exports and ASEAN's exports by commodity) is estimated. Lastly, the regression model with respect to ASEAN's *imports* from ROW (classified by ASEAN's total imports and ASEAN's imports by commodity) is estimated. After the regression equations for ASEAN's exports and imports, respectively, are run and estimated, the impacts of IPR protection on exports and imports across industries are also examined.

The rationale for setting up different specifications is as follows. First, using the data of total bilateral trade allows us to see the overall impact of IPRs on trade flows regardless of the direction of the trade. Second, using the data of ASEAN's exports and imports separately enables us to compare the impact of IPR regimes on ASEAN's exports with the case of ASEAN's imports. Third, using the same gravity equation for different sectors allows us to capture the distinctive features of each sector in terms of IPR-sensitivity.

3.3. Data

The data for 6 ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam) and 10 countries representing the Rest of the World (Australia, Canada, China, France, Germany, Japan, Korea, Netherlands, UK, and US) for 1990, 1995 and 2000 are used.[1] These 6 ASEAN countries above are the major actors in ASEAN, whereas the rest of the 10 Non-ASEAN countries are the major trading partners of ASEAN.

Data on bilateral trade flows (T_{ijt}), as measured in millions US$ are from the IMF Direction of Trade Statistics. Data on bilateral commodity trade, as measured in US$, are obtained from UN Statistics Division — Commodity Trade Statistics Database. Data on GDP, as reported in US$ millions, and population, as reported in millions, are extracted from the IMF World Economic Outlook Database. Data on geographical distances between country i and country j ($DIST_{ij}$) are collected from Indo.com (http://www.indo.com/distance/). Data on common language and ex-colony come from the Economist Intelligence Unit. Finally, to capture the effect of IPRs on bilateral trade flows, we use the IPR index developed by Park and Ginarte (1997).[2] Appendix 1 will summarize how the IPR index is calculated.

4. EMPIRICAL RESULTS

4.1. Results for pooled data

The summary of statistics for the data used in the estimation is presented in Appendix 2. The basic results for specification 1 are shown in Table 1. The gravity model fits the data well, explaining a major part of the variation in bilateral trade. The conventional variables behave very much as the model predicts. All estimated coefficients, except for the IPR index, are statistically significant at the 0.05 significance level. GDP turned out to be an important explanatory variable. GDPs of both exporting and importing countries register positive impacts on bilateral trade, and the impacts are highly significant. The coefficient on GDP indicates that one percent increase in the GDP of the exporting country increases the exporting country's exports by 0.66 percent. The coefficient on the importing country's GDP is also positive with elasticity of 0.67.

The coefficients on population are negative and statistically significant.[3] In the estimation, a one percent increase in the population of the exporting country reduces the exporting country's exports by 0.14 percent, while an increase in the importing country's population by one percent reduces the importing country's imports by 0.22 percent.

We also found the conventional negative sign on distance, and positive signs on common land border, common language and ex-common colonizer variables. The estimated coefficient on the log of bilateral distance is negative and statistically significant, implying that an increase in the log of bilateral distance by 1 percent leads to a 0.67 percent decline of

[1] The data on IPR index is available up to the year 2000 obtained directly from professor Park.

[2] The latest available data on IPR index, developed by Park Walter G. and Juan C. Ginarte, at the time of writing is only up to 2000.

[3] This result is consistent with the prediction of Linneman (1966) and others as explained in the section 3.1.

bilateral trade. A common land border, a common language, and ex-common colonizer could raise bilateral trade by 20.4, 17.8 and 9.9 percent respectively.

Table 1. Regression Result for Pooled Data

Explanatory Variables	βs	t-statistic
Constant	-1.0871**	-5.204
$LnGDP_{it}$ (Exporting country's GDP)	0.6652**	28.409
$LnGDP_{jt}$ (Importing country's GDP)	0.6749**	18.458
$LnPOP_{it}$ (Exporting country's POP)	-0.1368**	-4.528
$LnPOP_{jt}$ (Importing country's POP)	-0.2237**	-5.472
$LnDIST_{ij}$	-0.6714**	-17.042
$BORD_{ij}$	0.1854**	2.417
$LANG_{ij}$	0.1642**	4.622
Ex-$COLONY_{ij}$	0.0942*	2.090
IPR_j (Importing country's IPR)	0.0025	0.114
Number of observation	662	
Adjusted R^2	0.742	
F-statistic	211.91	

** Significant at the 0.01 level

* Significant at the 0.05 level

Finally, our primary interest is in the impact of IPRs on bilateral trade. Unfortunately, the coefficient on the patent rights index of the importing country is positive but statistically insignificant. This is because the positive effects are partly canceled out by the negative effects when the data for exports and imports are pooled together. This finding is consistent with Frink & Primo-Braga (2005: 19-40). A further investigation into the magnitude of the IPR elasticities of trade flows can be assessed not with the pooled data but with export or import data separately. To some degree, section 4.2 and 4.3 will answer why the coefficient of the IPR index in this model is positive but statistically insignificant.

4.2. Results for ASEAN's Exports

The estimated results for ASEAN's exports are presented in Table 2. The first row shows the estimates of coefficients for all industries. All coefficients show the expected signs, although not all of them are statistically significant. The coefficient on patent rights index is positive and highly significant, indicating the dominance of the market expansion effect. This implies that, on average, stronger IPR regimes in the ASEAN's trading partners will reduce the threat of imitation and induce greater ASEAN exports to these countries. So ASEAN countries tend to export more to those countries with relatively strong protection of IPRs. This result is consistent with that of Maskus & Penubarti (1997: 95-118), Rafiquzzaman (2002: 307-330), and Smith (1999: 151-177).

When assessing the impacts of IPRs on individual sectors, it is clear that the above effects vary across sectors. GDP of the exporting countries (ASEAN in this case) continues to be the important explanatory variable. The coefficient on GDP of importing countries is negative and statistically significant for the chemical sector. Since the chemical sector belongs to the high-tech industry, this implies that, in general, countries with higher GDPs tend to produce more of chemical products as their production capacity increases. The effects of distance

between countries are uniformly negative across all sectors. Although this coefficient is not statistically significant in some sectors, it implies that longer distance reduces trade.

On the supply side, countries with higher GDPs tend to have production capacity expanded, and invest more in R&D, especially in the high-tech sectors. Note that the GDPs in this case are GDPs of ROW. Most of the countries selected to represent ROW have high GDPs and high GDP per capita (except China and Korea). The ranking of these countries in terms of GDPs are as follows: USA, Japan, Germany, China, UK, France, Canada, Korea, Australia, and Netherlands (WEO, 2007). The ranking of countries in terms of GDP per capita are almost the same, except China and Korea.

When the impacts of IPR protection are allowed to differ across sectors, we observe that, although all coefficients are positive across all sectors, not all coefficients are statistically significant (the coefficients are statistically significant only in such sectors as chemicals, manufactured goods, and machinery and transport equipment). In addition, stronger effects of IPRs are found in high-tech sectors such as chemicals, transport equipment and machinery. This finding supports the view that, in these industries, the strengthening of patent rights does enhance trade through market expansion. In other industries, such as food and beverage and tobacco, the coefficients are not significantly different from zero.

Table 2: Regression Result for ASEAN's Exports

Industry	*Baseline*									*Patent Rights*	
	Constant	GDP_{it}	GDP_{jt}	POP_{it}	POP_{jt}	$DIST_{ij}$	$BORD_{ij}$	$LANG_{ij}$	$COLONY_{ij}$	IPR_j	*Adj.* R^2
All industries	-3.3578**	1.0496**	0.0864	-0.5174*	0.4790**	-0.1627	0.2968	0.0965	0.1935	0.3436**	0.690
	(-4.950)	(10.919)	(0.619)	(-10.116)	(3.798)	(-1.092)	(1.162)	(1.564)	(0.0756)	(5.844)	
Food and Live Animals	3.7132**	0.5724**	0.5113	0.0777	0.0662	-0.6680*	-0.1779	-0.2025	0.3007*	0.1488	0.387
	(3.091)	(3.430)	(1.904)	(0.877)	(0.270)	(-2.581)	(-0.461)	(-1.836)	(2.282)	(1.228)	
Beverage and Tobacco	-2.420	1.3822**	0.7378	-0.7714**	-0.0662	-0.4394	0.4896	-0.2216	0.2454	0.0535	0.333
	(-1.253)	(5.152)	(1.709)	(-5.412)	(-0.168)	(-1.056)	(0.789)	(-1.250)	(1.158)	(0.275)	
Fuels	10.625**	3.44**	-1.235	-0.477	2.251**	-3.239	0.436	-0.004	0.232	1.533**	0.405
	(3.15)	(2.90)	(-1.64)	(-1.91)	(3.27)	(-4.46)	(0.40)	(-0.01)	(0.63)	(4.56)	
Chemicals and Related Products	0.8920	2.2191**	-0.7842**	-1.0420**	1.1644**	-0.6891*	0.1070	0.0806	0.3370*	0.5971**	0.708
	(0.670)	(11.996)	(-2.634)	(-10.603)	(4.279)	(-2.402)	(0.250)	(0.659)	(2.307)	(4.443)	
Manufactured goods	2.0187*	1.4713**	0.0608	-0.0921	0.4298*	-0.8845**	-0.6662*	0.0633	0.1405	0.2757**	0.658
	(2.119)	(11.115)	(0.286)	(-1.310)	(2.207)	(-4.309)	(-2.177)	(0.724)	(1.344)	(2.868)	
Machinery and Transport Equipment	-2.0351	2.2463**	0.1646	-1.1738**	0.3580	-0.6362	0.3468	0.3734*	-0.0891	0.5069**	0.686
	(-1.265)	(10.053)	(0.458)	(-9.888)	(1.089)	(-1.836)	(0.671)	(2.529)	(-0.505)	(3.123)	

*** Significant at the 0.01 level*

**Significant at the 0.05 level*

Table 3: Regression Result for ASEAN's Imports

Industry	*Baseline*								*Patent Rights*	
	Constant	GDP_{it}	GDP_{jt}	POP_{it}	POP_{jt}	$DIST_{ij}$	$BORD_{ij}$	$LANG_{ij}$	$COLONY_{ij}$	IPR_j	*Adj.* R^2
All industries	-0.5464	0.9590**	1.0139**	-0.1751*	-0.6657**	-1.3869**	-0.0236	0.0990	0.1130	-0.1362**	0.810
	(-0.915)	(12.864)	(12.465)	(-2.641)	(-13.475)	(-11.637)	(-0.111)	(1.924)	(1.788)	(-4.474)	
Food and Live Animals	4.4570*	-0.1693	0.5889**	0.2729*	-0.1964	0.3689	0.0877	0.3979**	0.0211	-0.1185	0.281
	(2.588)	(-1.176)	(2.708)	(2.231)	(-1.286)	(1.518)	(0.231)	(3.663)	(0.163)	(-0.916)	
Beverage and Tobacco	4.8854	0.1800	-0.1306	0.7499**	-1.3623**	0.8426*	1.0779	0.2358	0.1037	-0.5117*	0.467
	(1.750)	(0.771)	(-0.370)	(3.781)	(-5.503)	(2.139)	(1.749)	(1.339)	(0.492)	(-2.441)	
Fuels	9.619**	0.332	1.399**	0.089	-0.991	-2.46**	0.049	0.258	0.336	-0.253	0.508
	(3.43)	(1.41)	(3.94)	(0.45)	(-3.98)	(-6.20)	(0.08)	(1.46)	(1.58)	(-1.20)	
Chemicals and Related Products	3.3953**	0.7665**	0.9263**	-0.1085	-0.4809**	-0.7899**	0.2785	-0.1253	0.1509	-0.1175	0.703
	(3.195)	(8.622)	(6.902)	(-1.438)	(-5.104)	(-5.269)	(1.187)	(-1.868)	(1.882)	(-1.473)	
Manufactured goods	8.5549**	0.7203**	0.9365**	-0.1037	-0.6871**	-1.8976**	-0.0370	0.1199	0.1456	-0.2323**	0.779
	(7.497)	(7.545)	(6.498)	(-1.280)	(-6.791)	(-11.786)	(-0.147)	(1.666)	(1.690)	(-2.711)	
Machinery and Transport Equipment	3.1040**	1.2903**	1.0756**	-0.2363**	-0.8494**	-1.3629**	0.0995	-0.0595	0.1235	-0.1396	0.841
	(2.841)	(14.118)	(7.796)	(-3.045)	(-8.769)	(-8.841)	(0.413)	(-0.864)	(1.498)	(-1.702)	

*** Significant at the 0.01 level*

**Significant at the 0.05 level*

4.3. Results for ASEAN's Imports

The regression results for ASEAN's imports are presented in table 3. The first row shows the estimates for all industries. The coefficient on patent rights index is negative and highly significant, indicating the dominance of the market power effect. This implies that, on average, the strengthening of IPR protection in the importing countries (ASEAN) does reduce ASEAN's imports. So ASEAN countries tend to import less as their IPR protection becomes stronger. This is consistent with the fact that most ASEAN countries are developing countries with weak imitation capacities. The market expansion effect is not sufficiently strong, since a large share of these markets might be already served by foreign providers. Therefore, as the market power effect outweighs the market expansion effect, the net effect on imports is negative. The coefficients for the other variables exhibit the expected signs, although not all of them are statistically significant.

Again it is clear that the above effects vary across sectors. The coefficients on GDP of exporting countries (for food sector) and importing countries (for beverage and tobacco) is negative but not statistically significant. For other sectors, the coefficients on GDP are positive and statistically significant, implying that GDP continues to be an important determinant of trade. Specifically, an increase in GDP of the importing countries and/or the exporting countries would increase trade.

Finally, our interest focuses on the coefficient for the IPR index across sectors where the coefficients are negative for all sectors. As shown in table 3, the coefficients on beverage and tobacco, and manufactured goods are statistically significant. Although the coefficients on

the IPR index for chemicals and machinery and transport equipment are not statistically significant, it could be implied that ASEAN countries, on average, have low imitation capacities. So, the market power effect dominates in the case of ASEAN's imports.

These results are consistent with empirical evidence that countries with relatively sufficient levels of industrialization (good imitation abilities) normally experience a positive effect of IPRs on imports – that is, market expansion effects. In contrast, for developing countries with low levels of industrialization and weak imitation abilities, the net trade effects are relatively weak or insignificant.

5. CONCLUSION

This paper analyzes the impacts of IPR protection on trade flows with a focus on ASEAN countries. Our empirical results are robust. Major findings are summarized as follows:

First, since the coefficient on the IPR index is positive and statistically insignificant in the case of total bilateral trade, we conclude that stronger protection of IPRs in the ROW and ASEAN at the same time leads to an ambiguous increase in bilateral trade between ASEAN and the ROW. This is because the increase in ASEAN's exports due to stronger IPR protection in the ROW is partly cancelled out by the decrease in ASEAN's imports as the result of stronger IPR protection in ASEAN. Thus, positive effect and negative effect offset each other, resulting in positive and statistically insignificant coefficient for IPR index.

Second, stronger protection of IPRs in the ROW is an important determinant of ASEAN's exports to the ROW. Since the coefficient on IPR index of the ROW is positive and statistically significant, we argue that the reinforced IPR protection in the importing countries (the ROW) has a positive impact on ASEAN's exports to the ROW, indicating the prevalence of the market expansion effect. When the impacts of IPR protection are allowed to differ across sectors, stronger effects are found in the high-tech sectors such as chemicals, machinery and transport equipment.

Third, stronger protection of IPRs in ASEAN is an important explanation for ASEAN's imports from the ROW. Unlike the impact of IPR protection on ASEAN's exports, the enforcement of IPR protection on the importing countries (ASEAN) has a negative effect on ASEAN's imports, exhibiting the dominance of the market power effect. When the impacts of IPRs on ASEAN's imports are allowed to differ across sectors, the coefficients are negative for all sectors and stronger effects are found in the manufactured goods, beverage and tobacco industries.

Industrial countries with relatively weak IPR systems and strong imitative abilities should experience an increase in bilateral imports when their IPR systems are strengthened. In contrast, in developing countries with weak patent rights and weak imitative capabilities, the effects of reinforced IPR regimes on their imports could be negative or ambiguous. Since many of the ASEAN members are low-income countries, it is expected that stronger IPR regimes in these countries will generate negative and, at most, ambiguous effects on its imports.

The implication is that a stronger patent regime should be accompanied by efforts to increase research intensity in ASEAN countries in order to offset the market power effect. As the result indicates, stronger protection of IPRs in the rest of the world would increase ASEAN's exports to the rest of the world. This result is consistent with the findings of Co (2004: 359-373) that in markets where potential competitors can arise (imitative ability is above certain critical level), exports of IPR-intensive goods increase with stronger patent

regimes. Weak IPR protection in the rest of the world is the barrier to ASEAN's exports (the effects are stronger in chemicals and transport equipment and machinery). In addition, most of ASEAN countries are those which should expect a large adjustment in domestic output and labor as fringing production activities in the rest of the world are replaced progressively by ASEAN exports. GDP, distance and language are important determinants of ASEAN's exports. The implication is that, in order to further accelerate ASEAN's exports, stronger protection of IPR in the rest of the world should be accompanied by higher GDP, improved land infrastructure, and foreign language ability in ASEAN countries. The finding also implies that the policy debate should not focus on whether or not stronger protection of IPR leads to the market power effect or the market expansion effect, but on where stronger protection of IPR *confer* the market power or expansion effects (on the basis of imitative capacity and research intensity). This debate is particularly relevant in high-tech sectors. Finally, some ASEAN countries are currently not members of the WTO. When IPR protection in these countries becomes stronger as they access the WTO, we would expect that the market power and market expansion effects would be large in magnitude.

APPENDIX 1: CONSTRUCTION OF IPR INDEX

This index grades the national IPR regimes of 110 countries on a scale of zero to five. To compute a country's ranking, Park and Ginarte created five categories, including membership in an international treaty, coverage, restriction on patent rights, enforcement and duration of protection. The following table refers to how the index of patent rights is constructed.

Construction of Patent Right Index

1. Membership in international treaty	*Signatory*	*Not Signatory*
Paris Convention and Revisions	1/3	0
Patent Cooperation Treaty	1/3	0
Protection of New Plant Varieties	1/3	0
2. Coverage	*Available*	*Not Available*
Patentability of pharmaceuticals	1/7	0
Patentability of chemicals	1/7	0
Patentability of food	1/7	0
Patentability of plant & animal varieties	1/7	0
Patentability of surgical products	1/7	0
Patentability of microorganism	1/7	0
Patentability of utility model	1/7	0
3. Restrictions on Patent Rights	*Does Not Exist*	*Exists*
Working Requirements	1/3	0
Compulsory Licensing	1/3	0
Revocation of Patents	1/3	0
4. Enforcement	*Available*	*Not Available*
Primary Injunctions	1/3	0
Contributory Infringement	1/3	0
Burden-Of-Proof Reversal	1/3	0
5. Duration of Protection	*Full*	*Partial*
	1	0<f*<1

* f equals the duration of protection as a *fraction* of the full (potential) duration. Full duration is either 20 years from the date of application or 17 years from the issuing date of the grant (for grant-based patent system).

Source: Park & Ginarte (1997)

APPENDIX 2-A: SUMMARY STATISTICS FOR ASEAN'S TOTAL TRADE

	LnY_{ijt}	$LnGDP_{it}$	$LnGDP_{jt}$	$LnPOP_{it}$	$LnPOP_{jt}$	$LnDIST_{ij}$	$BORD_{ij}$	$LANG_{ij}$	$COLONY_{ij}$	IPR_{jt}
Count	662.0000	662.0000	662.0000	662.0000	662.0000	662.0000	662.0000	662.0000	662.0000	662.0000
Mean	3.3687	5.6205	5.6205	1.7388	1.7388	3.7477	0.0514	0.2205	0.1329	3.4788
Sample variance	0.5069	0.4781	0.4781	0.2898	0.2898	0.1769	0.0488	0.1722	0.1154	1.0851
Standard deviation	0.7120	0.6914	0.6914	0.5383	0.5383	0.4206	0.2209	0.4149	0.3398	1.0417
Minimum	1.2499	3.8110	3.8110	0.4839	0.4839	2.4771	0.0000	0.0000	0.0000	0.3333
Maximum	5.3814	6.9946	6.9946	3.1029	3.1029	4.2300	1.0000	1.0000	1.0000	5.0000
Range	4.1314	3.1836	3.1836	2.6191	2.6191	1.7529	1.0000	1.0000	1.0000	4.6667

Source: Results from descriptive statistics

APPENDIX 2-B: SUMMARY STATISTICS FOR ASEAN'S EXPORTS

	LnE_{ijt}	$LnGDP_{it}$	$LnGDP_{jt}$	$LnPOP_{it}$	$LnPOP_{jt}$	$LnDIST_{ij}$	$BORD_{ij}$	$LANG_{ij}$	$COLONY_{ij}$	IPR_{ROW}
Count	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000
Mean	3.1257	4.8715	6.0566	1.5914	1.8261	3.9075	0.0121	0.2606	0.1818	3.9806
Sample variance	0.3181	0.0925	0.1966	0.3192	0.2559	0.0492	0.0120	0.1939	0.1497	0.5844
Standard deviation	0.5640	0.3042	0.4434	0.5650	0.5058	0.2217	0.1098	0.4403	0.3869	0.7645
Minimum	1.2499	3.8110	5.4213	0.4839	1.1747	3.3657	0.0000	0.0000	0.0000	1.2262
Maximum	4.3782	5.3490	6.9946	2.3120	3.1029	4.2137	1.0000	1.0000	1.0000	5.0000
Range	3.1283	1.5380	1.5733	1.8282	1.9282	0.8480	1.0000	1.0000	1.0000	3.7738

Source: Results from descriptive statistics

APPENDIX 2-C: SUMMARY STATISTICS FOR ASEAN'S IMPORTS

	LnM_{ijt}	$LnGDP_{it}$	$LnGDP_{jt}$	$LnPOP_{it}$	$LnPOP_{jt}$	$LnDIST_{ij}$	$BORD_{ij}$	$LANG_{ij}$	$COLONY_{ij}$	IPR_{ASEAN}
Count	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000	165.0000
Mean	3.0878	6.0566	4.8715	1.8261	1.5914	3.9075	0.0121	0.2606	0.1818	2.6484
Sample variance	0.3580	0.1966	0.0925	0.2559	0.3192	0.0492	0.0120	0.1939	0.1497	0.8238
Standard deviation	0.5983	0.4434	0.3042	0.5058	0.5650	0.2217	0.1098	0.4403	0.3869	0.9077
Minimum	1.3965	5.4213	3.8110	1.1747	0.4839	3.3657	0.0000	0.0000	0.0000	0.3333
Maximum	4.4201	6.9946	5.3490	3.1029	2.3120	4.2137	1.0000	1.0000	1.0000	4.5238
Range	3.0235	1.5733	1.5380	1.9282	1.8282	0.8480	1.0000	1.0000	1.0000	4.1905

Source: Results from descriptive statistics

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